

## Studies on bionomics and occurrence regulation of *Phigalia djakonovi* Moltrecht

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**Abstract:** Investigation and observation were made on bionomics and occurrence regulation of *Phigalia djakonovi* Moltrecht, which is a major pest of white birch, in Daxing'an Mountain forest area of Inner Mongolia during 1997 to 1999. The pest has one generation per year and overwinters as pupae in the soil in this area. Development, bionomics and outbreak of the pest are closely related with the food and environment conditions.

**Key words:** Bionomics; Occurrence Regulation; *Phigalia djakonovi* Moltrecht

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### Introduction

In recent years, *Phigalia djakonovi* Moltrecht (Lepidoptera: Geometridae) occurred seriously in Daxing'an Mountain forest area of Inner Mongolia. For example, in 1983, the occurred area of this pest was over 33 300 hm<sup>2</sup> and hundreds hectares of birch forest stands were damaged in the area. Shu (1987, 1988) studied the life cycle and bionomics of *Phigalia djakonovi*. From 1997 to 1999, we made further studies on bionomics and occurrence regulation of the pest in Yakeshi Forestry Administration, Inner Mongolia.

### Study method

Four fixed sample plots were established, each 20 m × 50 m, in different population density of *Phigalia djakonovi* Moltrecht. All the observations were undertaken in these sample plots.

### Life cycle

*Phigalia djakonovi* has one generation per year and overwinters in form of pupae in the soil in Daxing'an Mountain forest Area of Inner Mongolia. Adults emerge from mid-April to late May and lay eggs from late April to early June. Larvae are found from late

May to mid-July and a harmful peak occurs in mid-June to early July. Pupation is from early to late July.

### Bionomics and occurrence regulation

#### Adults

Adults emerge from mid-April to late May when the average temperature is 8.2-10.5°C, and in generally males emerge one or two days later than females. During a day, emergence occurs mostly at 13:00-20:00 hour. The adults stay in lower part of the stem in daytime and begin to move about at dusk. The most active time is at 20:00 to 23:00 hour, but they are inactive in windy, rainy or cool days. Adult males are of phototaxis. Sex ratio of the male to female adult is about 1:1.7.

Adults could mate just after their emergence and begin to lay eggs after 1-3 days of mating. Mated female adults crawl along the stem to find suitable oviposition sites. Most of the eggs are laid in duff or cracks of the lower part of stem. Female may lay eggs during day and night, but oviposition at night is a little more than in daytime. A female can lay as many as 600 eggs, averaging 200-300. The oviposition rate and oviposition progress are shown in Fig 1, and from which it can be found that the oviposition peak occurs on 3rd or 4th day after their emergence.

The life-span of adult is changing from 4 to 15 days, 9 days in average, and life-span of male is one or two days shorter than that of female.

#### Eggs

Fresh egg of *Phigalia djakonovi* is yellowish brown. It becomes darker and darker as development, and at last it changes to purplish black. Egg stage, short

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**Biography:** \*WANG Ya-qin (1966-), female, engineer in Yakeshi Forestry Administration, Inner Mongolia, P. R. China.

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or long, is closely related with the temperature of the month. It lasts about four weeks at an average temperature of 8.5°C. The egg stage may be less than four weeks under the condition of higher temperature, and it may be as long as five weeks in lower temperature condition. The average hatching rate is about 80%, with changes in range of 75% to 90% in different years.

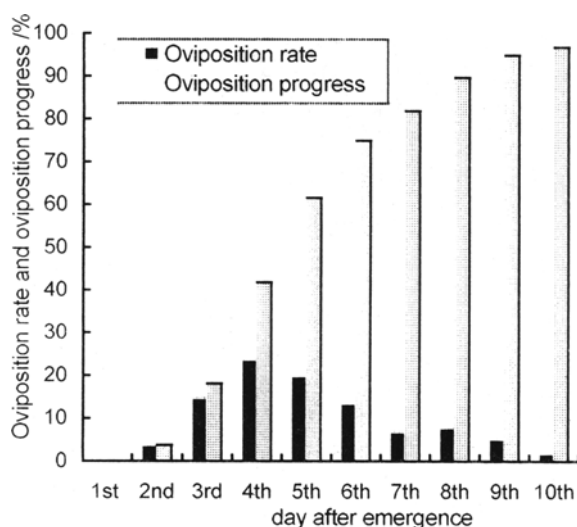


Fig 1. Oviposition rate and oviposition progress of *Phigalia djakonovi*

### Larvae

Newly hatched larva of *Phigalia djakonovi* is small and inactive. Low temperature may cause a lot of newly hatched larvae to death. 1st- or 2nd-instar larvae only feed on buds, with small appetite. From the 3rd instar they feed on the whole leaf and come into peak period of damage rapidly. With high density of population, the leaves of a tree may be eaten up in 3-5 days. Fig 2 shows the eating capacity for different instar larvae. Fully-grown larvae crawl down or hang down by silken threads to duff in diameter of 1.5 m near the tree and begin to pupate. The larvae spread and migrate mainly in three ways, crawling, wafting by wind and carrying by people and animals. The favorite host plant for larvae is white birch (*Betula platyphilla*), but when there is short of food during their outbreak period, they also can feed on leaves of poplar, willow, shrub and even grass on the ground. Investigation revealed that the population density of larvae varies greatly among different slopes. Generally, southern slopes have higher population density than northern slopes.

### Pupae

Pupation occurs from early to late July in earthen cells in the duff. The pupation rate is variable according to the condition of food, development of larvae and climate etc. During the period of outbreak years, the pupation rate is lower than usual because of the shortage of food and high density of population. Dissection of pupae found that most of the adults developed in inside of the pupa shells before overwintering.

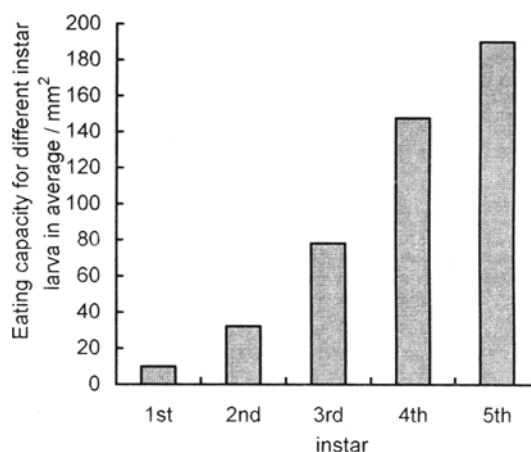


Fig 2. The capacity for eating of different instar larvae

### Control suggestions

- (1) Construction of larch and birch mixed forest stand can reduce damage the pest efficiently.
- (2) Cut down the egg branches and burn up.
- (3) Lure the male adults with black lamp and kill them.
- (4) There are several natural enemies of the pest, such as braconid, ichneumonid, spider, several species of birds and virus etc. Proper protection and use of these natural enemies can control the pest efficiently.

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